Liebig's approach to physiological chemistry promised to reveal the chemical events in animals without requiring direct empirical investigation of internal operations. This was only plausible because Liebig had assumed that all processes in animals were catabolic – breaking down complex substances into simple ones but creating nothing new. However, when Claude Bernard set out to determine where the oxidation of carbohydrates occurred in animals, he discovered that in fact glycogen was being synthesized. This surprising discovery revealed the oversimplification in Liebig's scheme (Bernard, 1848). This was a major inspiration for Bernard's very different conception of metabolic processes. As I discussed in Chapter 2, Bernard (1878a, p. 113) proposed that each organ in an organism performs one of the operations necessary to maintain the "constancy of the internal environment."

When he coined the concept of a catalyst, Berzelius had assumed that it would be a relatively straightforward project to generate a chemical account of fermentation. The discovery by Schwann, as well as Charles Cagniard-Latour (1838) and Friedrich Traugott Kützing (1837), that yeast were living suddenly made fermentation a more challenging case for those seeking to provide chemical accounts of physiological processes.[26] Louis Pasteur followed

[26] Liebig, Berzelius, and Wöhler perceived the threat to the program of giving chemical accounts of physiological processes, and their response was extremely harsh. Wöhler published excerpts of a paper by Turpin (1838) following up on Cagniard-Latour's research in *Annalen der Pharmacie*, which he and Liebig edited. Following the excerpts he published a heavy-handed satire (officially anonymous, but clearly the work of Wöhler, perhaps with the collaboration of Liebig) titled "The demystified secret of alcoholic fermentation," which purported to describe detailed observations with a special microscope: "Incredible numbers of small spheres are seen which are the eggs of animals. When placed in sugar solution, they swell, burst, and animals develop from them which multiply with inconceivable speed. The shape of these animals is different from any of the hitherto described 600 species. They have the shape of a Beindorf distilling flask (without the cooling device). The tube of the bulb is some sort of a suction trunk which is covered inside with fine long bristles. Teeth and eyes are not observed. Incidentally, one can clearly distinguish a stomach, intestinal tract, the anus (as a pink point), and the organs of urine excretion. From the moment of emergence from the egg, one can see how the animals swallow the sugar of the medium and how it gets into the stomach. It is digested immediately, and this process is recognized with certainty from the elimination of excrements. In short, these infusoria eat sugar, eliminate alcohol from the intestinal tract, and CO_2 from the urinary organs. The urinary bladder in its filled state has the shape of a champagne bottle, in the empty state it is a small bud. After some practice, one observes that inside a gas bubble is formed, which increases its volume up to tenfold; by some screw-like torsion, which the animal controls by means of circular muscles around the body, the emptying of the bladder is accomplished . . . From the anus of the animal one can see the incessant emergence of a fluid that is lighter than the liquid medium, and from their enormously large genitals a stream of CO_2 is squirted at very short intervals . . . If the quantity of water is insufficient, i.e. the concentration of sugar too high, fermentation does not take place in the viscous liquid. This is because the little organisms cannot change their place in